

**REPORT ON A COLLECTION OF BITING MIDGES OF THE GENUS  
CULICOIDES FROM GUATEMALA**

(DIPTERA, HELEIDAE)

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A study has been made of midges of the genus *Culicoides* Latreille collected by Colvin L. Gibson and Werner F. Ascoli, of the Laboratory of Tropical Diseases, National Institutes of Health, on detail to the Panamerican Sanitary Bureau, who were interested in their possible role as vectors of the filaria of human onchocerciasis in Guatemala. The collections were made principally in the municipalities of San Pedro Yepocapa and Acatenango, Department of Chimaltenango, at elevations between 2700 and 6300 feet. The geographical and climatic characteristics of this area are very well summarized by Dalmat (1950). They do not differ greatly from those around Huixtla (2300 feet elevation), State of Chiapas, Mexico, where Dampf collected most of the species described by Macfie (1948). Since a number of the same species are involved, the Gibson and Ascoli collection afforded a fine opportunity to supplement Macfie's descriptions with material from essentially the same faunistic area.

Gibson and Ascoli (1952) recently presented notes on the feeding habits of the four anthropophilic species of *Culicoides* in this area: *gibsoni* Wirth, *diabolicus* Hoffman,<sup>1</sup> *paraensis* (Goeldi) and *stigmatis* Wirth. Of these species, *paraensis* was the most numerous and annoying, biting man at all hours and under any weather conditions. *C. gibsoni* fed on man under about the same conditions as *paraensis*, but was comparatively rare. *C. stigmatis* fed most frequently between 4:30 and 6:00 P.M. under partly overcast skies and during warmer periods. *C. diabolicus* fed only during or immediately after light rain.

Gibson and Ascoli dissected 929 wild-caught specimens of these species in the onchocerciasis area of Guatemala without finding any microfilariae. They found microfilariae in 58 of 305 (19.0 percent) *stigmatis* and in 1 of 47 (2.1 percent) *diabolicus*, but in none of 10 *gibsoni* and 385 *paraensis* that had been allowed to feed on persons heavily infected with *Onchocerca volvulus*. However, the comparative scarcity of *diabolicus* and the fact that microfilariae could not complete their development in *stigmatis* make it seem unlikely that the species are important vectors in Guatemala.

In addition to the 1858 *Culicoides* specimens that had fed on man and were reported in their paper, Gibson and Ascoli collected 851 specimens feeding on man and horse (or mule) and at light. The species and numbers collected are shown in tables I and II.

<sup>1</sup>Reported by Gibson and Ascoli as *guttatus* (Coquillett), based on my erroneous determination. I have since satisfied myself that true *guttatus* is restricted to southern Brazil and that the Guatemala specimens collected by Gibson and Ascoli represent *diabolicus* Hoffman which was described from Panama.

All the biting collections at the lower elevation were made on man, whereas those at the higher elevation were mostly on horse or mule. In order of frequency, the species that bit man were *paraensis*, *pachymerus* (?), *stigmatis*, *diabolicus*, *gibsoni* and *debilipalpis*, whereas those that fed on horse or mule were *luteovenus*, *diabolicus* and *debilipalpis*.

TABLE I. *Culicoides* species collected in vicinity of San Pedro Yepocapa, Guatemala (elevation approximately 2770 feet).

Species	Number of Times Collected On Man	Number of Times Collected At Light	Number of Specimens Collected
<i>debilipalpis</i> Lutz	1	1	2
<i>diabolicus</i> Hoffman	6	—	12
<i>germanus</i> Macfie	—	2	7
<i>gibsoni</i> Wirth	2	4	16
<i>jamaicensis</i> Edwards	—	1	1
<i>pachymerus</i> Lutz (?)	12	—	66
<i>panamensis</i> Barbosa	—	2	26
<i>paraensis</i> (Goeldi)	13	1	159
<i>poikilonotus</i> Macfie	—	2	99
<i>propriipennis</i> Macfie	—	2	49
<i>pusillus</i> Lutz	—	1	1
<i>stigmatis</i> Wirth	7	—	10
New species near <i>obsoletus</i>	—	2	3
Number of collections made	22	3	

TABLE II. *Culicoides* species collected in vicinity of Acatenango, Guatemala (elevation approximately 5320 feet).

Species	Number of Times Collected On Horse	Number of Times Collected At Light	Number of Specimens Collected
<i>cova-garciai</i> Ortiz	—	1	1
<i>daedalus</i> Macfie	—	1	1
<i>debilipalpis</i> Lutz	2	—	3
<i>diabolicus</i> Hoffman	20	15	200
<i>gibsoni</i> Wirth	—	2	2
<i>luteovenus</i> Root and Hoffman	29	18	199
<i>panamensis</i> Barbosa	1	6	10
Species near <i>copiosus</i> R. & H.	—	4	4
Number of collections	49	25	

The species composition of the collections at light may be compared more directly. There are enough records of *luteovenus* and the species near *copiosus* to show their preference for the higher altitude and enough *germanus*, *pachymerus* (?), *paraensis*, *poikilonotus*, *propriipennis* and *stigmatis* were taken to indicate their preference for the lower elevation. The species *gibsoni*, *diabolicus*, *panamensis*, and *pusillus* probably occur throughout the altitudinal range, but the other species were taken too rarely to permit generalization on their

habit. The species taken at light only were, in order of abundance, *poikilonotus*, *propriipennis*, *germanus*, new species near *obsoletus*, *pusillus* and *jamaicensis* at 2770 feet; the species near *copiosus*, *daedalus* and *cova-garciai* at 5320 feet; and *panamensis* at both elevations.

#### NOTES ON THE SPECIES

##### *Culicoides daedalus* Macfie

*Culicoides daedalus* Macfie, 1947, Ann. Trop. Med. and Parasit. 42: 83.

One male taken at light at Acatenango, June 22, 1951, fits Macfie's figure and description except that the distal pale spot in cell R<sub>5</sub> meets the wing margin in its full breadth, the two distal pale spots in the anal cell are connected by a pale area and the apices of the parameres are not twisted so tightly. There are four almost equally long bristles in the hind tibial comb.

##### *Culicoides germanus* Macfie

###### Figure 1

*Culicoides germanus* Macfie, 1941, Ent. Mo. Mag. 76: 27.

Five males and two females taken at light at Finca San Rafael, San Pedro Yepocapa, April 3 and July 26, 1951, were identified as *germanus*. This species, which Macfie described from British Guiana from a female, is distinguished from other members of the *debilipalpis* group by the practically bare wings, hairy eyes, the female antennae with the flagellar segments in a continuous series of the same length, distal sensory tufts on segments 3, 8, 9 and 10, the palpi with a small, deep pit, the hind tibial comb very oblique, with one long and four rather short bristles, and with two equal oval spermathecae. Apparently the male has never been described and the genitalia may be characterized as follows:

*Male genitalia* (fig. 1). Ninth sternite with slight mesal emargination, the ventral membrane bare; ninth tergite tapering to well-developed apicolateral processes. Basistyles with foot-shaped ventral roots, dorsal roots stout and nearly as long; dististyles slender and nearly straight. Aedeagus with basal arch to about one-half or two-thirds of total length, the apex apparently with a rounded dorsal lobe and several indistinct, sharp distal points below. Parameres with small basal knobs, the stems slightly swollen at bases, sinuate and gradually narrowed to simple, abruptly recurved, filamentous apices.

##### *Culicoides gibsoni* Wirth

###### Figure 2

*Culicoides gibsoni* Wirth, 1952, Jour. Parasit. 38: 246.

This species was described from females taken by Gibson and Ascoli at San Pedro Yepocapa in the course of their onchocerciasis studies. In the present collection five males were taken, one in association with five females biting man at Finca Nimaya (2800 feet), San Pedro Yepocapa, November 9, 1950, the other four at Finca San

Rafael, San Pedro Yepocapa, April 3 and July 26, 1951, at light. The female has distal sensory tufts on antennal segments 3, 8, 9, 10, and 11 and the hind tibial comb with four bristles. The genitalia of the hitherto unknown male are described as follows:

*Male genitalia* (fig. 2).—Ninth sternite with a distinct rounded mesal excavation, the membrane between it and the aedeagus bare; ninth tergite slightly longer than basal breadth, the apicolateral processes short and broadly separated. Basistyles with ventral roots long and pointed with a small caudal hook near base, dorsal roots slender and nearly as long; dististyles slender and slightly curved to pointed apices. Aedeagus with basal arch to two-thirds of total length; the basal arms curved and slender; a pair of submedian, subapical projections arising near their point of union with the distal, median portion, the latter quite slender. Parameres with large basal knobs, stems very slightly swollen and distinctly bent at their middle; each abruptly recurved beyond a slight ventral pouch at distal three-fifths with apex gradually tapered to a fine point with a subapical fringe of fine barbs.

#### *Culicoides jamaicensis* Edwards

##### Figure 3

*Culicoides loughnani* var. *jamaicensis* Edwards, 1922, Bull. Ent. Res. 13: 165; Barbosa, 1947, An. Soc. Biol. Pernambuco 7:21; Fox, 1949, Bull. Brooklyn Ent. Soc. 44: 32.

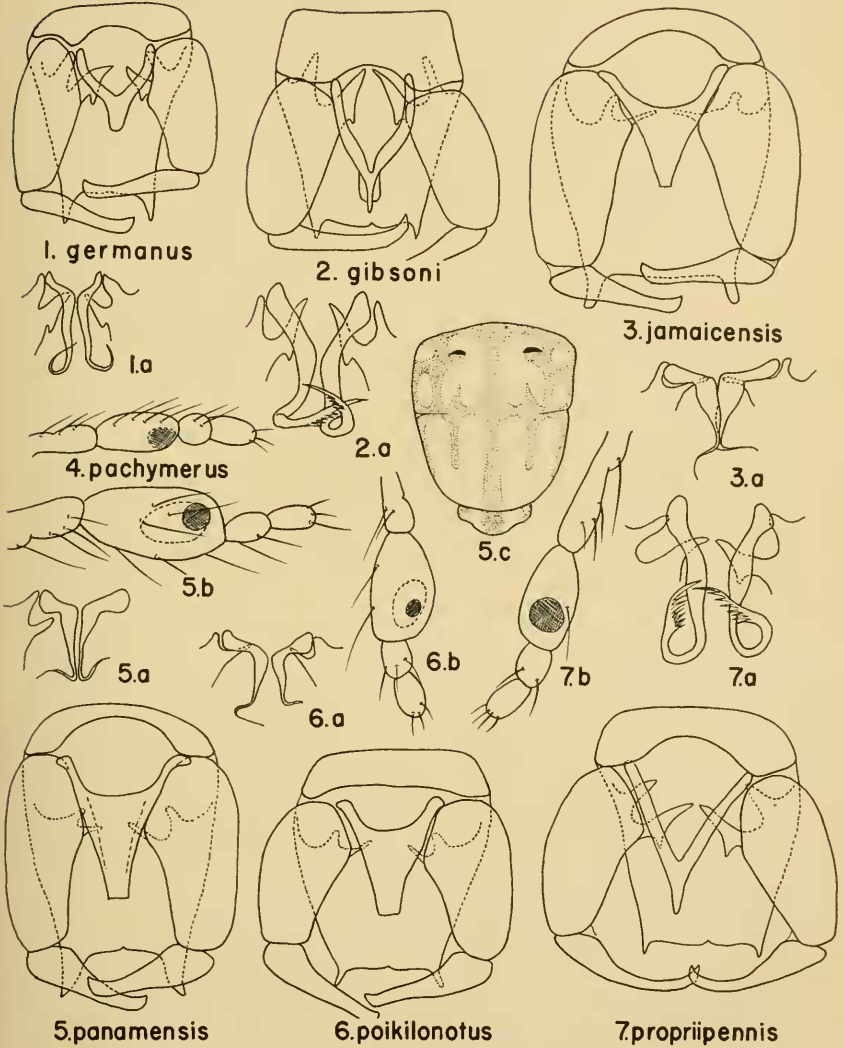
One male captured at light at Finca San Rafael, San Pedro Yepocapa, April 3, 1951. The male genitalia (fig. 3) closely resemble those of a male in the National Museum from St. Croix, Virgin Islands, except that the apicolateral processes are only about one-half as long and are not so slender. Barbosa's figure, apparently of the St. Croix specimen, shows the apicolateral processes too stout at the base and the aedeagus too stout and not tapering enough at the tip. *Culicoides copiosus* Root and Hoffman described from Mexico, is very close to *jamaicensis* but has the mesonotum more subshining, has only one pale spot at the apex of the anal cell and has the membrane posterior to the male ninth sternite spiculate.

#### *Culicoides pachymerus* Lutz ?

##### Figure 4

*Culicoides pachymerus* Lutz, 1914, Mem. Inst. Oswaldo Cruz 6: 83.

This species was described from five females collected on the Rio Negro, Brazil. The specimens were poorly preserved except for the wings and legs and Lutz' description gives few details except for leg characters and his excellent figures of the wing and hind leg. However, it may be possible to recognize *pachymerus* on the basis of the distinctly swollen fore and hind femora; legs with femora pale, the knees dark, the tibiae brownish with broad sub-basal pale bands, the tarsi yellowish; wing with the greatly elongated second radial cell apparently dark to the apex, cell  $R_5$  with the characteristic oblique dark subapical mark distinctly enclosing the rounded distal pale spot



Guatemala *Culicoides*, male genitalia with parameres drawn separately (a), and figures of female palpus (b) and mesonotal pattern (c) for some species. Fig. 1, *germanus*; fig. 2, *gibsoni*; fig. 3, *jamaicensis*; fig. 4, *pachymerus* (?); fig. 5, *panamensis*; fig. 6, *poikilonotus*; fig. 7, *propriipennis*.

which does not reach the wing margin; distal pale spot in cell  $M_1$  oval, nearly but not quite reaching wing margin; pale spot in anal cell also not reaching wing margin; macrotrichia scarce and confined to that part of wing distad of apex of second radial cell; body length 1.2 mm., wing 0.7 mm.

*Culicoides caprilesi* Fox, described from a female collected at Mount Marahuaca, Venezuela, differs from *pachymerus* mainly in wing markings, the distal pale spot in cell  $R_5$  being extended in the form of an inverted U to the wing margin and a subapical dark band extending forward to the second radial cell cutting off a small round pale spot at the costal margin just past the tip of this cell; the wing may be just a little hairier and the body is slightly longer (1.4 mm.).

*Culicoides uniradialis* Wirth and Blanton and *C. kintzi* Wirth and Blanton are closely related to the above two species, having the characteristic greatly swollen femora and oblique markings in cell  $R_5$ , but they both differ from the others in their paler wing markings which include the apex of the second radial cell in *kintzi* or more than one-half of the greatly elongate single radial cell of *uniradialis*, the distal pale spots meeting the wing margin in cells  $R_5$ ,  $M_1$  and anal cells, as well as in cells  $M_2$  and  $M_4$ . These two species, moreover, have distal sensory tufts on antennal segments 8, 9 and 10. Length of *uniradialis* 1.1 mm. (wing 1.1 mm.), of *kintzi* 1.0 mm. (wing 0.9 mm.).

Sixty-six females, all taken biting man in twelve separate collections at San Pedro Yepocapa, are probably *pachymerus* Lutz. They may be briefly characterized as follows:

Length 0.86 mm. (wing 0.75 mm.) Eyes broadly separated, bare; antennae with distal sensory tufts on flagellar segments 3, 9 and 10; palpi (fig. 4) very short and pale, segments in proportion of 5:10:20:6:8, third segment very slightly swollen, with a small, very shallow, sensory pit on distal half. Mesonotum (alcoholic specimens) tawny yellowish brown, apparently with a pair of elongate, submedian spots on anterior half paler. Legs stout, fore and hind femora especially swollen; pale yellowish, femora and tibiae except extreme bases of the latter, more or less brownish, especially at knees, hind tibial comb with four bristles. Abdomen yellowish, indistinctly banded with gray, darker at apex; two small, subequal, pyriform, well-sclerotized spermathecae. Wing with radial cells very long and narrow, second radial cell to 0.68 of wing length, slightly paler at apex; a few scattered macrotrichia in apices of cells  $R_5$  and  $M_1$ ; the pattern of light and dark spots as figured by Lutz very obscure, the distal pale spot in cell  $R_5$  rounded, rarely with a narrow pale extension from anterior edge to wing margin.

#### *Culicoides panamensis* Barbosa

##### Figure 5

*Culicoides panamensis* Barbosa, 1947, An. Biol. Soc. Pernambuco 7: 22.

*Culicoides alambiculatorum* Macfie, 1948, Ann. Trop. Med. and Parasit. 42: 81.

##### NEW SYNONYMY.

Barbosa (loc. cit.) described *panamensis* from two males and six females (on slides) collected by J. Zetek (no. 4667) in June, 1940 on

Barro Colorado Island, Canal Zone, from flowers of *Heliconia mariae*. One of the males was marked as the type by Barbosa although he did not make such designation nor list the other specimens in his paper. Barbosa gave a figure of the genitalia of the holotype male, and evidently took the female description and a figure of the palpus from one of the slide-mounted females he did not list. The female mentioned in his paper is a pin-mounted specimen labelled "Barro Colorado Island, C. Z., Jan.-Mar., 1944, Zetek no. 5126." This specimen, for which Barbosa gave a figure of the mesonotal pattern, is another species and has been made a paratype of *Culicoides carpenteri* Wirth and Blanton.

A series of seven males and nineteen females from Finca San Rafael, San Pedro Yepocapa, April 3 and July 26, 1951, and ten females from Acatenango, May 5 to August 8, 1951, all taken at light, are identical with the Panama specimens of *panamensis*. They also agree very well with Macfie's description of *Culicoides alambicolorum*, described from females from Chiapas, Mexico, which therefore becomes a synonym. Descriptive notes based on these two specimens follow:

Wing very hairy, with markings as figured by Macfie; no evident mesonotal pattern; pale markings of the legs confined to narrow subapical bands on fore femora and sub-basal ones on all tibiae, four rather long bristles in hind tibial comb; distal sensory tufts on segments 3, 11, 12, 13 and 14 of female antenna; female palpus (fig. 5b) with third segment strongly swollen, a large, deep pit opening through a small pore on distal end; spermathecae very unequal and retort-shaped.

A figure (fig. 5) is given of the male genitalia of a Guatemala specimen for comparison with Barbosa's, which was made from a specimen obliquely flattened on a slide.

#### *Culicoides poikilonotus* Macfie

##### Figure 6

*Culicoides poikilonotus* Macfie, 1947, Ann. Trop. Med. and Parasit. 42:82.

*Culicoides cacozelus* Macfie, 1947, idem. 42: 85. NEW SYNONYMY.

Macfie described *poikilonotus* and *cacozelus* each from a single female taken on May 28 and June 5 respectively at El Vergel, Chiapas, Mexico, in a light trap. Macfie separated these species only on the difference (which he figured) in wing markings; the former having the pale spot on vein  $M_2$  extending across the vein into cell  $M_2$ , the latter with the pale spot lying entirely in front of the vein. He further stated that they "are so similar that it may be questioned if they are distinct species, or two forms of a single species. Here I have regarded them as distinct, pending the examination of further specimens, especially males."

I have studied two series totalling 54 males and 45 females taken at light on April 3 and July 26, 1951, at Finca San Rafael, San Pedro Yepocapa, which agree well with Macfie's descriptions of *poikilonotus* and *cacozelus*. The extensive pale mesonotal patches (fig. 6c) and

the female palpal structure (fig. 6b) are very distinctive. The distal sensory tufts of the female antennae are found on segments 3, 5, 11, 12, 13 and 14. One long and three quite short bristles in hind tibial comb. The female spermathecae are subequal and nearly spherical. There is great variation in the extent of the pale spot on vein  $M_2$ , with all intergrades between the types figured by Macfie representing his two species. I can only conclude, therefore, that one somewhat variable species is involved, for which the name *poikilonotus* has page precedence.

Ortiz (1952) has described the female of a species from San Felipe, Yaracuy, Venezuela, which he identified as *cacozelus*. This female, however, must belong to another, probably new, species since it differs from *cacozelus* in having but one distal pale spot in the anal cell and the third palpal segment is not so broad with the pit shallower and opening broadly.

*Male genitalia* (of *poikilonotus* from Guatemala, fig. 6).—Ninth sternite a narrow transverse band, without mesal excavation or spiculate membrane; ninth tergite short, tapered, the apicolateral processes slender, somewhat variable in length (the shorter type figured) and with bases widely separated. Basistyles with ventral and dorsal roots very small, the former slender and hardly visible; dististyles nearly straight, with slightly narrowed, bent-in apices. Aedeagus very broad and stout, the basal arch attaining from one-fourth to one-half of total length, the distal portion with sides tapering gradually to a broad, truncate apex. Parameres small, the bases expanded laterad, the stems bulbous basally and abruptly bent caudad and strongly tapered to very slender, twisted, filamentous points.

#### *Culicoides propriipennis* Macfie

##### Figure 7

*Culicoides propriipennis* Macfie, 1948, Ann. Trop. Med. and Parasit. 42: 84.

Macfie described this species from a single female taken in a light trap at San Cristobal, Chiapas, Mexico. Gibson and Ascoli took 32 males and 17 females at Finca San Rafael, San Pedro Yepocapa, April 3, and July 26, 1951, at light. Descriptive notes: Mesonotum with conspicuous, large, pale patches; wing as figured by Macfie, but the two distal spots in cell  $R_5$  vary in size and often partially fuse, the third pale spot at wing margin in cell  $M_1$  sometimes faint or lacking; legs with knees dark, narrow subapical pale bands on fore and mid femora and sub-basal bands on all tibiae; four long bristles in hind tibial comb; female antennae with distal sensory tufts on segments 3, (8), 9, 11, 12, 13 and 14; female palpus (fig. 7b) with third segment short and swollen, bearing a broad, shallow sensory pore.

*Male genitalia* (fig. 7).—Ninth sternite with broad mesal excavation, the membrane bare; ninth tergite tapered, the apico-lateral processes very short, slender and widely separated. Basistyles with large, foot-shaped ventral roots and wedge-shaped dorsal roots about one-half as long; mesal margins of basistyles with scattered fine spinules; dististyles curved with slender apices. Aedeagus V-shaped, the anterior fork to about three-fifths of total length, the basal arms



straight, the posterior disto-median lobe slender with simple apex. Parameres very large, their bases knobbed, stems slightly swollen and sinuate, the slender apices abruptly bent ventrad with a subapical fringe of barbules which is basally broadened but distally attenuated to a slender filament.

**Culicoides** new species near **obsoletus** (Meigen)

Three specimens were taken of this species which is being described in a separate paper by Wirth and Blanton on Panama *Culicoides*. One male and one female were taken at light at Finca San Rafael, San Pedro Yepocapa, April 3, 1951 and one female was taken at light at Finca Las Victorias, 3500 feet, San Pedro Yepocapa, December 1, 1950.

**Culicoides** species near **copiosus** Root and Hoffman

Four females were taken at lights at Acatenango, elevation 5320 feet, April 27, July 10 and 26, and September 4, 1951. The condition and brevity of the series do not permit description of the species, although it is probably new.

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BOOK NOTICE

**MONOGRAPHIE SYSTEMATIQUE, PHYLOGENETIQUE ET ZOOGEOGRAPHIQUE DES HYMENOPTERES CRABRONIENS**, by Jean Leclercq. 371 pp., 40 text figs., 84 maps. Paper covers, 8vo., offset publ., 1954. \$14.00.

This important work is indispensable to the taxonomist engaged in identification of wasps and, in addition, is of great interest to the student of zoogeography. Several short preliminary chapters discuss morphology, phylogeny and ethnology of the crabronine wasps. These are followed by three lengthier chapters on the zoogeography of the Crabronini of the world, and of Belgium and neighboring countries, with a set of 84 maps illustrating generic and specific distributions. The section of most interest to the taxonomist comprises three appendices which consist of a key to the included genera, a synonymic catalog of the 84 genera and subgenera and 700 species, and a systematic tabulation of the known nesting habits and prey preferences. The catalog includes references to all papers published subsequent to Kohl's work (1915) for the Palaearctic species or to Dalla Torre's catalog (1897) for species of the other major regions, as well as citations to all the original descriptions. The volume may be obtained from John D. Sherman at the price quoted above, or from Classey in England or Reitter in Germany.—KARL V. KROMBEIN, *Entomology Research Branch, U. S. Department of Agriculture, Washington, D. C.*